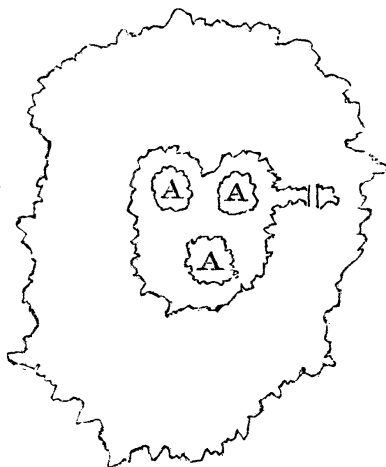


*The Nuclei of a Sun-spot.* By T. K. Mellor.

On 1897 February 7 our sky here, which had been persistently overclouded for a number of days, became clear again, and on turning my telescope upon the Sun I saw a large spot with two or three smaller ones around it. It had already passed the centre, and was approaching the western limb, from which it was distant about a quarter of the Sun's diameter.

The spot, although large, was very much of the normal type, the umbra being surrounded by a symmetrical penumbra, the breadth of which was approximately that of the diameter of the umbra ; but in addition to its size there were two features about it which attracted my attention, and made me determine to give it a very careful examination. I also made an outline sketch, a copy of which is appended.

It will be seen that at one place a long arm of the umbra projects into the penumbra, and the end of this arm was cut off and separated from the rest by a bright arc or bridge, which was as brilliant as a facula, and was very conspicuous against the darker background of the penumbra.



But what interested me more was the fact that the umbra itself was not of uniform darkness, as upon one side I saw a large patch, which was sensibly lighter in shade than the remainder, and soon afterwards I recognised something of the same kind upon the other side, although this was of smaller extent. In order to observe this better I removed the diagonal prism and dark glass which I was using and replaced them by a Dawes solar eyepiece. With a weak dark glass and a small diaphragm I was able to distinguish quite clearly that in the umbra there were three dark nuclei, marked A in the sketch, which were intensely black. Although the air was exceptionally steady this observation was difficult on account of the tremor caused by the heat and the constant lengthening and shortening of the focus ;

but during the moments of best definition it appeared to me that these three nuclei were approximately circular, although I could not trace any distinct borders to them. They were all surrounded by the lighter background, and at no point did they touch the inner edge of the penumbra, but were always separated from it by an appreciable margin.

At first I supposed that what I saw was simply an effect of irradiation, but I satisfied myself that the phenomena were real.

The telescope is an equatorial refractor, by T. Cooke & Sons, of York, of 6 inches aperture, and the powers employed were from 60 to 200.

The contrast in colour between the black nuclei and the remainder of the umbra was very slight, but still it was distinctly perceptible, and by careful looking could be traced wherever it extended. These nuclei have been seen by former observers, and may possibly exist in every spot if we could but see them; but how they are caused or whether they are phenomena of growth or of decay must be left to the investigations of future observers.

*Discordances of Index Errors of the Madras Mural Circle in the years 1834-1842 inclusive.* By A. M. W. Downing, M.A., D.Sc., F.R.S.

In the course of the re-reduction of Taylor's Madras Observations, on which I am engaged, it became necessary to decide whether it was possible to make the declinations independent determinations, or whether it was necessary to make them differential with regard to an adopted standard catalogue, as Taylor had done. The materials for the former course are supplied by the observations of the "Reflecting Collimator," or of the nadir, as we should call it, which were commenced on 1834 August 11, and were continued (with some interruptions) from that date down to the end of the series of observations in 1842.

As the observations which were combined to form the Madras General Star Catalogue (which are those with which we are here concerned) extend from 1831 to 1842, it became necessary to ascertain whether the index errors deduced from the nadir bore any fixed or other determinable relation to those deduced from comparing the corrected circle-readings with the declinations of the Standard Catalogue. It would thus be possible to determine whether index errors corresponding to the nadir could be carried back to the commencement of the series of observations, and carried through the gaps in the nadir observations.

The adopted north latitude of the Madras Observatory, which has been applied to the nadir observations to obtain the index errors is  $13^{\circ} 4' 8''.1$ . The substantial accuracy of this value